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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,139	06/23/2003	Zuhua Zhu	0980/64609-Z	1575

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EXAMINER
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NGUYEN, PHILLIP

ART UNIT	PAPER NUMBER
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2828

DATE MAILED: 03/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/602,139

Applicant(s)

ZHU ET AL.

Examiner

Phillip Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.



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Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites "In a vertical cavity surface emitting laser (VCSEL) comprising..., comprising:" which is not clear whether this is preamble or limitation of the claim. Applicant is suggested to rewrite the claim such as:

In claim 1:

--A vertical cavity surface emitting laser (VCSEL) comprising:

vertically stacked of material layers including a first material layer positioned above a second material layer;

an intermediate region being disposed therebetween, electrical current flowing between the first material layer and the second material layer through the intermediate region during operation of the VCSEL; and

a current confinement structure for laterally restricting the flow of electrical current passing the intermediate region, wherein said current current confinement structure comprising:

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a central column of semiconductor material vertically extending between the first  
and second material layers;

a subsurface...

an outer support... second layer.--

Claim 1 also recites in line 17 “non-conducting material” which is not clear whether it is non-electrically conducting material or non-thermally conducting material. Similarly in claim 7, the claim recites “non-conductive” which is not clear.

Claim 4 recites “said non-solid material is air or vacuum” which is not correct because “vacuum” is NOT a material, according to the definition in Webster dictionary, vacuum is a space that is empty with matter.

Claims 8, 10, and 13 recite “said upper material layers” which is lack of antecedence basis. Claim 10 further discloses “said first material layer being an active layer which is contradict with claim 1 because in claim 1, the first material layer positioned above the second material layer wherein a intermediate layer is located between the 1<sup>st</sup> and 2<sup>nd</sup> material layers which the intermediate layer has a current confinement structure. It is understood that the current confinement structure includes reference numbers 112 and 126. It is impossible that the first layer could be an active layer.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 7-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al.

(658).

With respect to claim 1, Lee discloses in Figure 2 a VCSEL comprising vertically stacked material layers including a first material 210 positioned above a second material 204, an intermediate region 206 disposed therebetween the first and second material layers, a current confinement structure for laterally restricting current comprising a central column of semiconductor 206 extending between the first and the second material layers; a subsurface cavity 216 laterally extending between the first and the second material layers, said cavity being filled with non-solid material; an outer support element 215 laterally surrounding said subsurface cavity, said support element comprising non-conducting material.

With respect to claim 7, Lee discloses the outer support element and 206 and central supporting column being formed from a common layer of semiconductor and said outer supported element being implanted so as to be non-conductive (see Figure 2).

With respect to claim 8, Lee discloses the first material layer 210 being implanted in lateral region thereof lying above said outer support element.

With respect to claim 9, Lee discloses a plurality of lower material layers 202 positioned below the second material layer 204, said second material layer being an active layer.

With respect to claim 10,

With respect to claims 11-13 and 19-21, it is inherent that the current confinement comprises an oxidation resistant, low bandgap semiconductor material in order to reduce the current conduction. Lee further discloses the lower material layers 202 comprises a DBR.

With respect to claim 14, Lee discloses the claimed invention as shown in rejection of claim 1 combining with claims 8 and 9.

With respect to claims 15-18, Lee discloses at least 3 vertical etched shafts extending downward (see Figure 3), wherein the shafts are plugged with polyamide and sealed with subsurface cavity is filled with air (col. 5, lines 55-65).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. ('685) in view of Sirbu et al. ('029).

With respect to claim 2, Lee discloses the claimed invention except for a plurality of upper material layers positioned above said first material. Lee discloses at least three etched shafts (see Figure 3). Sirbu discloses in Figure 1 a plurality of upper semiconductor layers 12a.

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For the improvement of the laser device, it would have been obvious to the one having ordinary skill in the art at the time the invention was made to provide a plurality of upper material layers as taught by Sirbu.

With respect to claims 3-6, Lee discloses the cavity being plugged and filled with non-solid material such as air (col. 5, lines 55-65).

### *Citation of Pertinent References*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The patent to Lee et al. discloses Method and Apparatus for Planar Index Guided Vertical Cavity Surface Emitting Lasers, U.S. Patent No. 6577658

The patent to Sirbu et al. discloses Micro-electromechanically Tunable Vertical Cavity Photonic Device and Method of Fabrication Thereof, U.S. Patent No. 6546029

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***Communication Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip Nguyen whose telephone number is 571-272-1947. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, PAUL IP can be reached on 571-272-1241. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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